12VPK4.5A

Library Sort	**Product Specifications**	VER	A	No.	DA356
Library Name	**Polymer Li-ion Battery Pack**	Date	2006/09/25		

Cylindrical Li-ion battery Pack

Specification

MODEL:12VPK4.5A

Prepared/Date	Auditing/Date	Approved/Date
Wuyaj	LVCHENGXUE	GAOPENGKUN

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1. Li-ion Battery Pack Specifications

1.1 Polymer Li-ion Battery Pack Data Sheet

TYPE ----------Li-ion battery Pack
MODEL----------12VPK4.5A
Nominal voltage----------11.1V

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Weight ----------≤140g

C_5mAh----------4000mAh

C_5mA----------4000mA

Charg voltage----------12.6±0.15V

Minimum discharge end voltage----------8.25V

Maximum charge voltage----------12.6V

Standard continuous charge current----------0.2C5mA

Maximum continuous charge current----------0.5C5mA

Maximum continuous discharge current----------0.5C5mA

Capacity (20°C±5□, 0.2C_5 to 2.75V)

Minimum capacity----------3900mAh

Internal impedance□20□±5□ AC Impedance 1KHz□---------□240mΩ

Charge and discharge conditions (20□±5□)

Standard charge----------Constant current and constant voltage (CC/CV)

Current=0.2C_5mA Voltage=12.6V End Current=60mA

Fast charge---------- Constant current and constant voltage (CC/CV)

Current=0.5C_5mA Voltage=12.6V End Current=60mA

Standard discharge----------Constant current (CC)

Current=0.2C_5mA End Voltage=8.25V

Operation conditions (recommended□

Standard charge---------- 0-45□

Discharge---------- -20-60□

Storage humidity

Relative humidity------- (45-75%)

Temperature range for Storage (Percentage of recoverable capacity 80□)

1 month -20□+60□

3 months -20□+45□

1 year -20□+20□

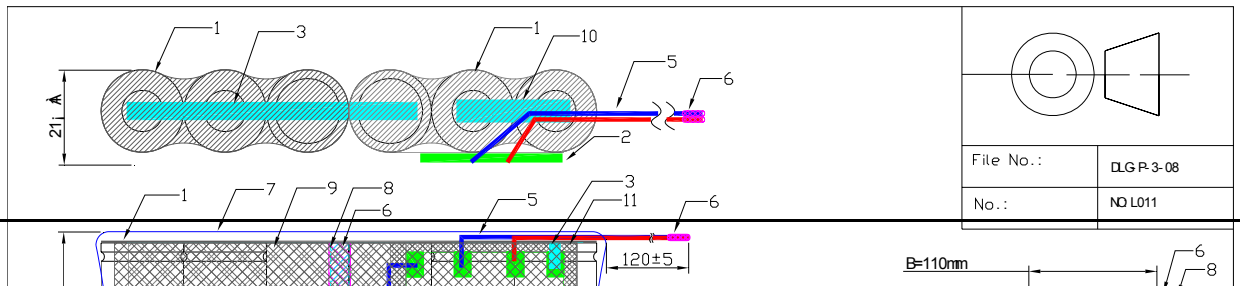
Standard Test Conditions (Except additional quest)

Temperature---------- 20□±5□

Relative humidity---------- 65±20%

Subject to change without prior notice

1.2 Li-ion Battery Pack Drawing



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1.3 Li-ion Battery Pack Characteristics

Test item	Test conditions	Requirements
(1)Outside Appearance	Visual check	No abnormal stain, Deformation nor damage

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(2) Standard test conditions	Measurements are carried out at 20±5□ and relative humidity of 65±20% without other specified condition. Accuracy of voltmeters and ammeters used in test is equal to or better than the grade 0.5.	
(3) Standard charge	Cells shall be charged continuously at the constant current of 0.2C_5mA to 12.6V, then charge at the constant voltage of 12.6V until the end current of 60mA	
(4)Standard discharge	Cells shall be discharged continuously at the constant current of 0.2C_5mA to 8.250V	
(5) Fast charge	Cells shall be charged continuously at the constant current of 1C_5mA to 12.6V, then charge at the constant voltage of 12.6V until the end current of 60mA	
(6) Open-circuit voltage (OCV)		≥11.25V
(7)Rated Capacity	Cells shall be charged in Item (3) and discharged in Item (4) within 10 minutes after full charged. If the discharge duration does not reach the specified value, the test may be repeated up to three times in total.	Rated capacity: ≥3900mAh
□8□Capacity high-rate discharge	Cells shall be charged in Item (3) and discharged at the constant current of 10C_5mA to 8.25V within 10 minutes after full charged. If the discharge duration does not reach the specified value, the test may be repeated up to three times in total.	Discharge capacity: ≥80%C_5mAh
(9) Cycle Life (20□)	Cells shall be charged continuously at the constant current of 0.5C_5mA to 12.6V then charge at the constant voltage of 12.6V until the end current of 20mA and discharged continuously at the constant current of 0.5C_5mA to 8.25V.A cycles defined as one charge and discharge, carry out cycles until discharge capacity <60% C_5mAh	≥300 cycles
(10)Low temperature discharge	Cells shall be stored under -20□±2□ for 16h□ 24h after charged in Item (3),then discharged at constant current of 0.2C_5mA to 5.50V	Discharge capacity□ ≥60%C_5mAh
(11)High temperature discharge	Cells shall be stored under 60□±2□ for 16h□ 24h after charged in Item (3),then discharged at constant current of 0.2C_5mA to 8.25V	95%C_5mAh

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(12)Storage characteristics	Cell shall be charged in Item (3) ,and stored in a temperature-controlled environment at 20±5□ for 60 days. After storage, cell shall be discharged in Item (4) to obtain the remaining capacity.	Remaining capacity ≥ 90%C_5mAh

1.4 Duration of Guarantee the Product

We can keep on the quality in six month. In order to keeping on the quality of the batteries, Battery should be charged and discharged once every three months.

1.5 Cell Condition at the Shipment

To be determined (Recommendation Approx. 7.50–7.80V about 30% charged state)

1.6 Storage

The Polymer Li-ion Battery Pack should be stored indoor, and should be far from the fire and the high temperature.

1.7 Handling Precautions

To assure product safety, describe the following precautions in the instruction manual of the equipment.

! Danger

- Do not heat or throw battery into a fire.
- Do not use, leave battery close to fire or inside of a car where temperature may be above 60□. Also do not charge / discharge in such conditions.
- Hairpins, coins, or screws. Do not store batteries with such objects.
- Do not short circuit the (+) and (-) terminals with other metals.
- Do not place battery in a device with the (+) and (-) in the wrong way around.
- Do not hit with a hammer, step on or throw or drop to cause strong shock.
- Do not disassemble or modify the battery.
- Do not solder a battery directly.
- Do not use a battery with serious scar or deformation.

! Warning

- Do not use battery with dry cells and other primary batteries, or batteries of a different package, type, or brand.
- Stop charging the battery if charging is not completed within the specified time.

During use, charge, or storage.

- Keep away from fire immediately when leakage or foul odor is detected.
- If liquid leaks onto your skin or clothes, wash well with fresh water immediately.

If liquid leaking from the battery gets into your eyes, do not rub your eyes. Wash them well with clean water and go to see a doctor immediately.

! Caution

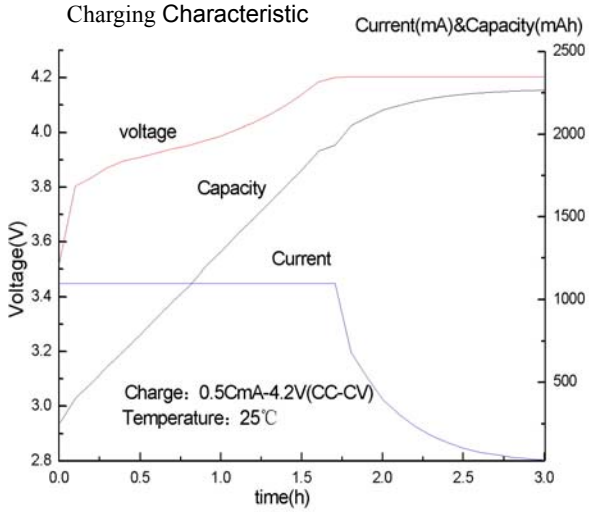
- Store batteries out of reach of children so that they are not accidentally swallowed.
- Batteries have life cycles. If the time that the battery powers equipment becomes much shorter

than usual, the battery life is at an end. Replace the battery with a new same one.

- Remove a battery whose life cycle has expired from equipment immediately.
- When the battery is thrown away, be sure it is non-conducting by applying vinyl tape to the (+) and (-) terminals.
- When not using battery for an extended period, remove it from the equipment and store in a place with low humidity and low temperature.
- While the battery pack is charged, used and stored, keep it away from objects or materials with static electric charges.
- The battery can be used within the following temperature ranges. Do not exceed these ranges.
  Charge temperature range : 0□ to 45□
  Discharge temperature range : -20□ to 60□
  (When using equipment)

2. Li-ion Battery Specifications

2.1. Primary technical Parameters



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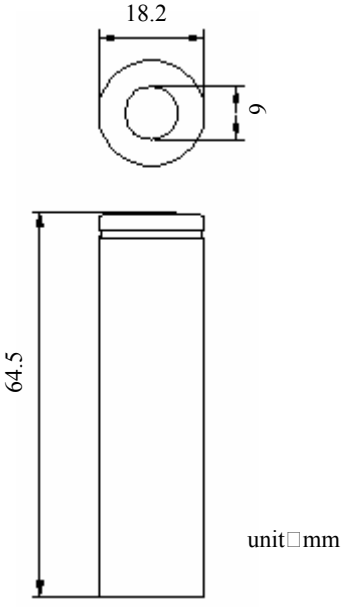
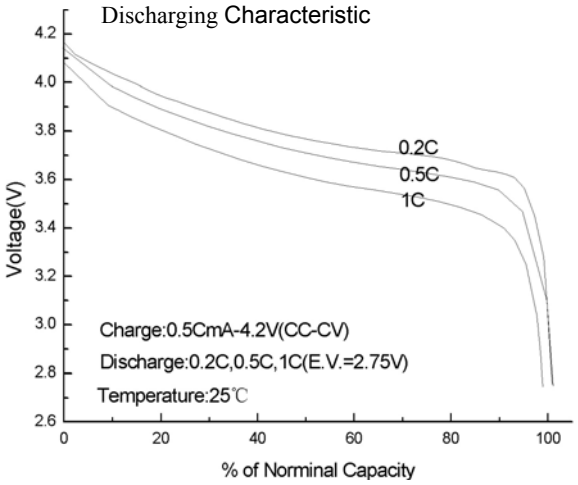
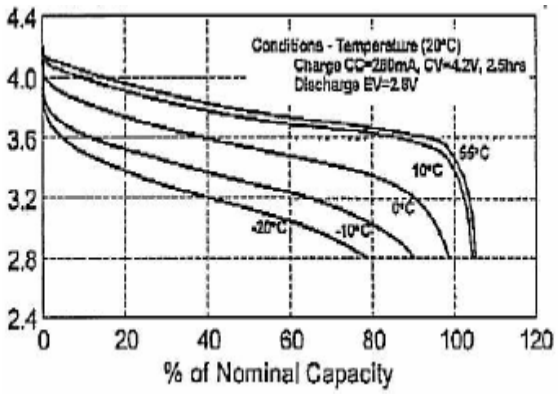
Type	□Rechargeable Lithium-ion Cylindrical Cell
Dimension	□Φ=18.2±0.2mm □H=64.5±0.5mm
C_5mAh	□2000
C_5mA	□2000
Nominal Voltage	□3.7V
Capacity	□Nominal 2000mAh Minimum 1950mAh when discharged at 0.2C_5mA to 2.75V
Recommended Charging Conditions	□400□1500mA charge termination control parameters taper current 20mA at 4.2V
Maximum continuous discharge current	□3000mA
Service Life	□300cycles□≥80% C_5mAh□
Weight	□Approx.45g
Internal Resistance	□80mΩ max. at 1000Hz
Charging Voltage	□4.200±0.05V
Ambient Temperature Range	□Charging □-20□+45□ Discharging □-20□+60□ Storage □-5□+35□



Discharging Characteristic



Temperature Characteristic



Note:

1□C_5□the rated capacity, unit: Ah or mAh.

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2.2 Performance

Test item	Test conditions	Requirements
(1)Outside Appearance	Visual check	No abnormal stain, Deformation nor damage
(2)Standard test conditions	Measurements are carried out at 20±5□and relative humidity of 65±20% without other specified condition. Accuracy of voltmeters and ammeters used in test is equal to or better than the grade 0.5.	
(3) Standard charge	Cells shall be charged continuously at the constant current of 0.5 C_5mA to 4.2V, then charge at the constant voltage of 4.2V until the end current of 20mA	
(4)Standard discharge	Cells shall be discharged continuously at the constant current of 0.2 C_5mA to 2.75V	
(5)Fast charge	Cells shall be charged continuously at the constant current of 1 C_5mA to 4.2V, then charge at the constant voltage of 4.2V until the end current of 20mA	
(6)Open-circuit voltage (OCV)		≥3.75V
(7)Rated Capacity	Cells shall be charged in Item (3) and discharged in Item (4) within 30minutes after full charged. If the discharge duration does not reach the specified value, the test may be repeated up to three times in total.	Rated capacity: ≥100%C_5mAh
(8)high-rate discharged Capacity	Cells shall be charged in Item (3) and discharged continuously at the constant current of 1500mA to 2.75V within 10minutes after full charged. If the discharge duration does not reach the specified value, the test may be repeated up to three times in total.	Discharge capacity: ≥90%C_5mAh
(9)Cycle Life (20□)	Cells shall be charged continuously at the constant current of 0.5C_5mA to 4.2V and discharged continuously at the constant current of 0.5C_5mA to 2.75V.A cycles defined as one charge and discharge . Carry out cycles until discharge capacity <80% C_5mAh	≥300 cycles
(10)Low temperature discharge	Cells shall be stored under -20□±2□ for 16h□24h after charged in Item (3),then discharged at constant current of 0.2 C_5mA to 2.75V	Discharge capacity□ ≥60%C_5mAh
(11)Storage characteristics	Cell shall be charged in Item (3) ,and stored in a temperature-controlled environment at 20±5□ for 28 days. After storage, cell shall be discharged in Item (4) to obtain the remaining capacity.	Remaining capacity ≥ 90%C_5mAh

2.3□Mechanical test

Test Item	Test Conditions	Requirements

(1)Vibration Test	Vibrate test sample for 90minutes per each of the three mutually perpendicular axis(x,y,z)after rated charge. Amplitude: 0.38mm(10-30Hz)□0.19mm□30-55Hz□ Frequency: 10-55Hz(1oct/min) Direction: X, Y After test , cells are discharge at constant current of 0.2I_tmA,and cycles per 1(3)and 1(4)for 3 cycles to obtain recovered capacity	No rupture, fire, smoke, Nor critical damage □90% C_5mAh
(2) Drop Test	Drop 100% charged test sample from 1 meter above onto concrete board with more than 5cm thickness two times each for every direction after rated charge. After test , cells are discharge at constant current of 0.2I_tmA,and cycles per 1(3)and 1(4)for 3 cycles to obtain recovered capacity	No rupture, fire, smoke, Nor critical damage □90% C_5mAh

2.4□Safety Evaluation

Test Item	Test Conditions	Requirements
(1)Hot Oven Test	The charged batteries are to be heated in a gravity convection or circulating air oven. The temperature of the oven is to be raised at a rate of 5±2□ per minute. The oven is to remain for 30 minutes at 130±2□ before the test is discontinued.	No fire, Nor explosion
(2)Short Circuit Test	After fast charge at 20±2□, Connect battery terminals with electric wire (electric resistance: 50mΩ or less). And stop the test when the temperature of battery is 10 □ lower than peak temperature.	No fire, Nor explosion
(3)Overcharge	After discharged at 1 C_5mA and to 2.75V, the batteries shall be charged at 3I_tmA current with a voltage limit of 4.6V.chargeing is continued for 8 hours	No fire, Nor explosion
(4)Dip test	The charged battery shall be dipped in water for 24h in an ambient temperature of 20□±5□.	No fire, Nor explosion

2.5□Charge State of Battery before shipment

To be determined.(Recommendation Approx. 3.75 – 3.85V 30% charge)

2.6□Duration of guarantee the product

We can keep on the quality in six month.

2.7□Protection

When Li-ion rechargeable battery is used over the permitted voltage or current, electrolyte may disassemble, and this case will affect safety performance of Li-ion rechargeable battery. So"PTC heat-fuse" and protection circuit module were used in order to prevent overcharge, overdischarge and overcurrent.

The parameters of protection circuit module as follows:

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overcharge protection voltage 4.250±0.025V

overdischarge protection voltage 2.30±0.08V

overcurrent protection ≤5.0A

2.8 Handling precautions on Lithium Ion Rechargeable Battery

To assure product safety, describe the following precautions in the instruction manual of the equipment.

! Danger

- When charging the battery, use dedicated chargers and follow the specified conditions.
- Use the battery only in the specified equipment.
- Do not connect battery directly to an electric outlet or cigarette lighter charger.
- Do not heat or throw battery into a fire.
- Do not use, leave battery close to fire or inside of a car where temperature may be above 60 . Also do not charge / discharge in such conditions.
- Do not immerse, throw, and wet battery in water/ seawater.
- Do not put batteries in your pockets or a bag together with metal objects such as necklaces. Hairpins, coins, or screws. Do not store batteries with such objects.
- Do not short circuit the (+) and (-) terminals with other metals.
- Do not place battery in a device with the (+) and (-) in the wrong way around.
- Do not pierce battery with a sharp object such as a needle.
- Do not hit with a hammer, step on or throw or drop to cause strong shock.
- Do not disassemble or modify the battery.
- Do not solder a battery directly.
- Do not use a battery with serious scar or deformation.

! Warning

- Do not put battery into a microware oven, dryer, or high-pressure container.
- Do not use battery with dry cells and other primary batteries, or batteries of a different package, type, or brand.
- Stop charging the battery if charging is not completed within the specified time.
- Stop using the battery if abnormal heat, odor, discoloration, deformation or abnormal condition is detected

During use, charge, or storage.

- Keep away from fire immediately when leakage or foul odor is detected.
- If liquid leaks onto your skin or clothes, wash well with fresh water immediately.

If liquid leaking from the battery gets into your eyes, do not rub your eyes. Wash them well with clean water and go to see a doctor immediately.

! Caution

- Store batteries out of reach of children so that they are not accidentally swallowed.
- If younger children use the battery, their guardians should explain the proper handling.
- Before using the battery, be sure to read the user's manual and cautions on handling thoroughly.
- Thoroughly read the user's manual for the charger before charging the battery.
- For information on installing and removing from equipment, thoroughly read the user's manual for the specific equipment.
- Batteries have life cycles. If the time that the battery powers equipment becomes much shorter than usual, the battery life is at an end. Replace the battery with a new same one.

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- Remove a battery whose life cycle has expired from equipment immediately.
- When the battery is thrown away, be sure it is non-conducting by applying vinyl tape to the (+) and (-) terminals.
- When not using battery for an extended period, remove it from the equipment and store in a place with low humidity and low temperature.
- While the battery pack is charged, used and stored, keep it away from objects or materials with static electric charges.
- If the terminals of the battery become dirty, wipe with a dry clothe before using the battery.
- The battery can be used within the following temperature ranges. Do not exceed these ranges.
  Charge temperature range : 0□ to 45□
  Discharge temperature range : -20□ to 60□
  (When using equipment)

12VPK4.5A capacity test

Model:12VPK4.5A

Test condition **The battery is charged at 2000mA constant current ending at 12.6Voltage and charged at 12.6V ending at current less than 60mA then discharged at 2000mA constant current ending at 8.25Voltage**